A CASE HISTORY INVESTIGATION OF WINTERTIME STORMS WHICH PRODUCE SUSTAINED SURFACE WINDS 50 KNOTS OR GREATER AT TEXAS TOWER 2 AND TEXAS TOWER 3 - PART 2

Summary of Results

Technical Paper Number 63-6

4WW FORM 9 AUG 61

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Part 2

SUMMARY OF RESULTS

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May 1963

A. INTRODUCTION:

This report supplements our study, "A Case History Investigation of Winter Storms which Produce Sustained Surface Wind Speeds 50 knots or greater at Texas Tower 2 and Texas Tower 3," and summarizes our forecasting experience on the tower forecasting project using the procedures outlined in the study. The study was published in September 1962. However, the forecasting procedures set forth in the study were completed on 18 December 1961 and were used as forecasting guides from that date.

B. TEXAS TOWER FORECASTING RESPONSIBILITIES:

1. The Staff Weather Officer to the Boston Air Defense Sector (BOADS), Stewart AFB, New York had the primary responsibility for the preparation of weather warnings for the Texas Towers (1). Tower project forecasters at the NORAD Forecast Center (NFC), Ent AFB, Colorado provided a continuous meteorological watch and coordinated with the BOADS SWO on each evacuation forecast (2).

2. On 27 March 1963, the Commander, Air Defense Command transferred responsibility for the Texas Tower evacuation and reoccupation decisions to the Commander, 551st AEW Control Wing, Otis AFB, Massachusetts. The weather warning responsibility remained with the Staff Weather Officer, BOADS and the NORAD Forecast Center continued a tower meteorological watch. On 1 May 1963, the Staff Weather Officer at Otis AFB assumed the tower weather warning responsibility.

C. EVACUATION CRITERIA:

1. The Air Force policy during the 1961-62 and 1962-63 winter storm seasons was essentially to remove personnel from the towers whenever sustained winds of 50 knots or more were forecast. However, winds of 50

knots or more with frontal type systems were not considered by ADC as requiring an evacuation of the towers.

2. After September 1962, the evacuation criteria included "Hatteras" Lows that were forecast to move into the Texas Tower area, regardless of whether or not wind speeds of 50 knots or more were predicted (1).

D. VERIFICATION:

1. Verification summaries for all types of storms during the 1961-1962 and 1962-1963 seasons are shown in the following tables. Data for the two seasons are shown in compatible form although the evacuation criteria (as shown above) were not the same. Following each season's individual storm verification listing is a summary of the tower forecasting accuracy for each season. The Hatteras Low criterion introduced during the early part of the 1962-1963 season made the tower forecasting task much easier. This is reflected in the higher forecasting accuracy figures for the 1962-63 season.

2. A note on the total number of storm threats is needed since the procedures for determining which storms constitute a threat were more stringent for the 1962-63 season. With this different system, fewer storms were considered to be threats in 1962-63.

3. Verification of Texas Tower Forecasts 1961-1962 Season.

a. Individual storm verification:

Type	Date	Meteorological		Significant Seas (ft)	
		Forecast	Verification	Latest Forecast at Time of Evacuation Decision	Highest Verified
Winter Storm	18 Dec 61	≥50 kts	55 kts	3-7	10
Winter Storm	25 Dec 61	≥50 kts	52 kts	7-9	16
Winter Storm	2 Jan 62	≥50 kts	50 kts	10-16	14
Winter Storm	6 Jan 62	≥50 kts	43 kts	6-10	12
Winter Storm	28 Jan 62	≥50 kts	36 kts	6-10	9
Winter Storm	9 Feb 62	≥50 kts	45 kts	10-15	17
Winter Storm	15 Feb 62	<50 kts	58 kts	14-18	16
Winter Storm	24 Feb 62	≥50 kts	45 kts	5-10	17
Winter Storm	6 Mar 62	≥50 kts	66 kts	not >35	53
Winter Storm	12 Mar 62	≥50 kts	58 kts	not >35	10
Winter Storm	21 Mar 62	≥50 kts	48 kts	not >35	15-18
Winter Storm	12 Apr 62	<50 kts	55 kts	not >35	15-18

b. Summary of tower forecasting accuracy 18 December 1961 through 30 April 1962:

(1) Evacuation forecasts:

Number issued.....10

Number where criteria verified..... 5

Percent correct.....50%

(2) Evacuation criteria met:

Number of times..... 7

Number correctly forecast..... 5

Percent correct.....72%

(3) Total storm threats:

Number.....86

Number correctly forecast.....79

Percent correct.....92%

4. Verification of Texas Tower Forecasts 1962-1963 Season.

a. Individual storm verification:

Type	Date	Meteorological		Significant Seas (ft)	
		Forecast	Verification	Latest Forecast at Time of Evacuation Decision	Highest Verified
Winter Storm	29 Jun 62	≥ 50 kts	30 kts	6	5
Hurricane Alma	27-30 Aug 62	Cross 30°N	Yes	20-25	20
Winter Storm	23-24 Sep 62	≥ 50 kts	60 kts	35-40	31
Winter Storm	27-28 Sep 62	≥ 50 kts	31 kts	30-35	15
Hurricane Daisy	5-8 Oct 62	Cross 30°N	Yes	35-40	41
Hurricane Ella	16-22 Oct 62	Cross 30°N	Yes	40	7
Hatteras Low	31 Oct-1 Nov 62	Thru Tower Area	Yes	18	12
Hatteras Low	2-4 Nov 62	Thru Tower Area	Yes	30-35	11
Hatteras Low	4-5 Nov 62	Thru Tower Area	Yes	20	10
Winter Storm	10-16 Nov 62	< 50 kts	72 kts	24	32
Hatteras Low	26 Nov-7 Dec 62	Thru Tower Area	Yes	30-35	21
Hatteras Low	9-10 Dec 62	Thru Tower Area	Yes	15-25	10
Hatteras Low	11-12 Dec 62	Thru Tower Area	Yes	8-12	6
Hatteras Low	21-23 Dec 62	Thru Tower Area	Yes	25-30	20
Hatteras Low	25-27 Dec 62	Thru Tower Area	Yes	6-10	6
Hatteras Low	29 Dec 62-2 Jan 63	Thru Tower Area	Yes	20-25	25
Winter Storm	6-9 Jan 63	≥ 50 kts	50 kts	25-30	15
Hatteras Low	18-19 Jan 63	Thru Tower Area	Yes	10-15	5
Hatteras Low	20-21 Jan 63	Thru Tower Area	Yes	6-10	7
Hatteras Low	26-28 Jan 63	Thru Tower Area	Yes	6-10	20

Type	Date	Meteorological		Significant Seas (ft)	
		Forecast	Verification	Latest Forecast at Time of Evacuation Decision	Highest Verified
Hatteras Low	30-31 Jan 63	Thru Tower Area	Yes	12	15
Hatteras Low	1-4 Feb 63	Thru Tower Area	Yes	3-5	12
Hatteras Low	4-8 Feb 63	Thru Tower Area	Yes	12-16	10
Hatteras Low	9-13 Feb 63	Thru Tower Area	Yes	12-18	15
Winter Storm	19-20 Feb 63	≥ 50 kts	58 kts	12-18	20
Hatteras Low	24-25 Feb 63	Thru Tower Area	Yes	6-10	10
Hatteras Low	26-28 Feb 63	Thru Tower Area	Yes	12-18	9
Winter Storm	1-2 Mar 63	≥50 kts	56 kts	10-15	10
Winter Storm	5-7 Mar 63	<50 kts	53 kts	12-18	15
Winter Storm	12-13 Mar 63	<50 kts	53 kts	6-10	5
Hatteras Low	19-21 Mar 63	Thru Tower Area	Yes	10-15	18
Hatteras Low	6-8 Apr 63	Thru Tower Area	Yes	12	8
Hatteras Low	9-10 Apr 63	Thru Tower Area	Yes	12	8
Winter Storm	22-24 Apr 63	≥50 kts	38 kts	12	13

b. Summary of tower forecasting accuracy 1 June 1962 through 30 April 1963 (includes all types of storm threats):

(1) Evacuation forecasts:

Number issued.....31

Number where criteria verified.....28

Percent correct.....90%

(2) Evacuation criteria met:

Number of times.....31

Number correctly forecast.....28

Percent correct.....90%

(3) Total storm threats:

Number (including hurricanes).....76

Number correctly forecast.....70

Percent correct.....92%

E. DISCUSSION OF THE VERIFICATION:

1. The verification summaries are the results of the 4th Weather Wing's actual experience on the Texas Tower forecasting endeavor.

2. The scores shown in the verification section of this report are not as high as we estimated in the forecast study (Section J). This was not primarily caused by a weakness in the study but rather due to one or more of the following:

a. Compromises of the evacuation forecasts because of extensive coordination among three different groups of forecasters.

b. Requests from personnel making the evacuation decisions for wind speed predictions prior to times recommended in the forecast study.

c. Different forecasting abilities and operational interests among the numerous forecasters that worked on the forecasting endeavor.

d. Variations in the ADC mode of operations that caused the forecasting decisions to be made much earlier than the times defined by the climatological boundaries shown in the forecast study.

F. COMMENTS ON FUTURE RESEARCH:

1. Although the tower problem will no longer exist after the summer of 1963, several of the suggestions for further research outlined in the study are still applicable.

2. As are pointed out in our study (Section K, paragraph 4) and Dr. K. R. Johannessen, AWSSS/PSO, stated in his trip report (Reference 3) much work needs to be done to understand and predict storms that form or develop along the Atlantic seaboard. Although a number of scientific articles have been written on this subject, nothing has been done to comprehensively include present-day upper-air data. Dr. Johannessen suggested that there may be found useful discriminating parameters in the upper-air flow patterns to characterize potentially dangerous east coast storms. Civilian as well as military uses for this type of study for the populous eastern states are numerous.

3. The information available on NMC surface prognostic charts (as sent out on the facsimile network) show only the most likely future pressure and frontal patterns. Means of communicating possible extreme developments as well as probability levels for various storm tracks are needed by forecasters in the field (3).

REFERENCES:

1. "ADC Operational Plan for Evacuation and Reoccupation of Texas Towers," ADC OPLAN 19-62, 10 November 1962.

2. "Weather Support for Evacuation and Reoccupation of Texas Towers," 4th Weather Wing Operations Plan 19-62, 15 November 1962.

3. Trip Report, K. R. Johannessen, AWSSS/PSO, to Detachment 11, 12th Weather Squadron, Stewart AFB, New York, 4-8 December 1962.